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Spaceport News

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Mission update

GOES-L

At press time, the launch of the GOES-L weather spacecraft was scheduled for early morning on May 3 from Complex 36 Pad A at Cape Canaveral Air Force Station.

The Geostationary Operational Environmental Satellite is the latest in a series of satellites managed by the National Oceanic and Atmospheric Administration (NOAA).

The real-time weather data gathered by GOES satellites, combined with readings from Doppler radars and automated surface observing systems, greatly aids forecasters in providing warnings of severe weather.

The launch of GOES-L continues a 25-year joint program between NASA and NOAA, a government agency under the aegis of the Department of Commerce. The United States operates two meteorological satellites in geostationary orbit 22,300 miles above the Equator.

GOES-L will be "stored" on orbit, ready for operation when needed as a replacment for one of the two satellites now in use, GOES-8 and GOES-10. The satellite will be renamed "GOES-11" upon reaching geostationary orbit.

GOES-L will be transported on an Atlas IIA rocket. KSC is responsible for government oversight of launch operations and countdown activities

The spacecraft has an expected minimum life span of five years.

Workers rise to challenge

Power unit replaced on difficult timeline

Had the weather cooperated, the launch of Space Shuttle Atlantis would have taken place on time — the result of a swift and unprecedented repair by KSC workers.

With only two weeks remaining in Space Shuttle Atlantis' tight processing schedule, Shuttle managers asked the KSC workforce to change out a critical Shuttle component. The 320-pound power drive unit for the orbiter's rudder/speed brake had failed a routine test, but replacing it would be anything but routine.

A team of KSC work planners, engineers and technicians assembled on April 10 to finalize the strategy for a task that they had never before executed at the launch pad. Disconnecting the bulky power drive unit with Atlantis in a vertical orientation posed the threat of air intrusion into the orbiter's hydraulic system – an unacceptable condition for flight. Successful replacement required a tremendous amount of coordination. Cryogenic development, heavy lift operations, new work procedures and seven straight days of effort rested squarely on the shoulders of KSC's workforce along with the standard launch preparations that remained.

"We weren't that worried about each technical task," explained Ed Mango, NASA Shuttle project engineer. "I think the most challenging part of this job was integrating the multiple tasks into one smooth plan."

The rudder/speed brake is hinged

(See Repair, Page 2)

Retriever gets tryout

A one-person submarine sits on the deck of the Liberty Star retrieval ship. NASA and United Space Alliance have experimented with the craft for possible use in the retrieval of solid rocket boosters following Space Shuttle launches. Please see story, page 3.

KSC proves capabilities 3 times over

STS-101 offered a reminder that, for all the intricate choreography KSC manages during a Space Shuttle launch, there remains one crucial element beyond the Center's control: the weather.

For three consecutive days, launch teams and the crew of seven astronauts were fully prepared to send Atlantis on a course for the International Space Station. But unacceptable weather each day — either at KSC or elsewhere— kept the Shuttle on the ground.

It was the first time that managers attempted a launch on three consecutive days.

For the attempts on April 24 and 25, crosswinds in excess of the established limits at KSC's Shuttle Landing Facility prevented launch. Those weather rules govern the conditions that would safely allow for a landing under the Return to Launch Site procedure in case of a

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Repair ...

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to the orbiter's vertical tail and allows the ship's commander or pilot to control right and left yaw, as well as air speed during critical entry and landing maneuvers. The hydraulic power drive unit (PDU) is located inside the tail, at the base of the hinge, and its job is to push a system of drive shafts and mechanical actuators. The PDU rotates the two-ply rudder/speed brake panels together for orbiter yaw control and flares them apart for air speed control. Without a good PDU, the rudder/speed brake will not function.

"It became clear that the part had to be changed out in order to fly, so we asked the team to develop a safe plan and to take their time implementing it," said Dave King, KSC Director of Shuttle Processing. "With safety as our foremost goal, our folks made every effort to meet the scheduled launch date."

While NASA and United Space Alliance flow managers labored over the PDU replacement plan, engineers at KSC's Cryogenic Testbed Facility had to prove that a crucial part of that plan would work. To prevent air intrusion into the hydraulic system, workers would have to freeze the six titanium hydraulic lines that lead to and from the PDU before removal.

In only three days, KSC's cryogenic test team designed, fabricated and tested a copper manifold used to freeze the PDU lines. Testing confirmed the feasibility of the process and proved that it would not harm flight hardware.

"After the first test, I had no doubt that we would be successful," said Andreas Dibbern, NASA hydraulic systems engineer. "But our excitement grew as each step brought us closer to accomplishing something that we had never done before."

Once the concept was proven, engineers at the launch pad wrapped the 6-foot long, 1/4-inch diameter copper lines around the 5/8-inch diameter PDU hydraulic lines on Shuttle Atlantis. With liquid nitrogen flowing through the copper manifold at minus-320 degrees F, a 4-inch plug of fluid was frozen solid inside each line in only minutes. Workers could now disconnect the 2-feet-square high PDU from the ship.

The burden then shifted to a team of technicians and heavy equipment operators who actually removed the faulty unit and replaced it with one that had been pulled from Shuttle Columbia at Boeing's processing facility in Palmdale, Calif. Managers mobilized a 250-ton crane, a 40-ton crane, and two cherry pickers capable of lifting about four workers each at Launch Pad 39A.

"We deal with heavy lift operations all the time – including lifting the orbiter. So we didn't perceive this effort as a problem at all," recounted Fred Pearson, vertical operations manager for United Space Alliance. "From the crane operators to the technicians, I have a very experienced crew. We just all came together to execute the plan. The system engineers really removed a lot of obstacles and made our job much easier."

On April 12 at about 7:30 p.m., with workers positioned on the pad surface preparing ground support equipment, crane operators at the ready, supervisors and safety personnel on the Mobile Launcher Platform, and technicians in the cherry pickers, more than 16 people were postured to support. The actual PDU replacement took less than 4 hours and electrical/mechanical connections were completed the next day.

Test engineers in Firing Room No. 1 of KSC's Launch Control Center conducted a retest of the Shuttle's entire hydraulic system on April 15 and 16. Testing confirmed that the power drive unit had been replaced successfully with no air intrusion.

Shuttle engineers at Johnson Space Center led a thorough evaluation of the initial PDU failure and determined that it was not a constraint for this flight. Additional PDU testing may be required prior to other flights.

The ensemble effort ensured Atlantis would be ready to fly as scheduled on April 24, although weather concerns postponed the launch until May 18.

At Launch Pad 39A, Greg Lohning of NASA inspects the wiring on the newly installed Power Drive Unit (PDU) in Space Shuttle Atlantis.

STS-101 gets boost from first Shuttle flight

STS-101 bears a tangible connection to the first Space Shuttle flight.

An element of one of the solid rocket boosters attached to Atlantis was used on STS-1, the inaugural mission that launched in April 1981. The part, the forward cylinder of the booster's left forward segment, will be making its seventh Shuttle flight.

Each of the two boosters consists of 11 separate pieces combined in four rocket segments. The 12-foot cylinder from STS-1 fits just below the forward dome, the booster's uppermost element.

The solid rocket boosters go through a refurbishment process that begins after they are captured at sea and towed to Hangar AF at Cape Canaveral Air Force Station. The boosters are assessed, and disassembled, with the pieces loaded onto rail cars and sent to a plant in Utah owned by the manufacturer, Thiokol Propulsion.

The insulation from each piece is removed in Utah, and the components go through high-pressure cleaning and further evaluation. When a piece is determined to be free of cracks or flaws, it receives new paint and insulation and is loaded with propellant.

The element then moves into inventory storage at another Thiokol plant and is eventually matched with other components to form booster segments. The segments return by rail to KSC for use on a future flight.

"Each one of the cylinders is designed for 20 uses," said Ted Shaffner, manager of Thiokol's KSC operations office. "It takes approximately a year for the full cycle, from launch to getting one back here."

In addition to its six previous flights, the cylinder also took part in a technical evaluation between STS-51-B and STS-57. The two uppermost pieces of the right booster for STS-101 were first used on the second Shuttle mission.

Submarine may aid in booster retrieval

One-person craft could lessen risks

It is a crucial part of every Space Shuttle mission: The retrieval of spent solid rocket boosters from the sea.

The post-launch operations for STS-101 had been scheduled to include a demonstration to evaluate the use of a one-man submarine during booster retrieval. The planned demonstration is part of a continuing program by NASA and United Space Alliance (USA) to augment safety in all phases of Space Shuttle operations.

USA, prime contractor to NASA for the Space Shuttle program, is responsible for retrieving the two expended solid rocket boosters (SRB) after they separate from the Space Shuttle about two minutes into powered flight. The boosters splash down in an impact area about 140 miles east of Jacksonville and are towed back to Cape Canaveral Air Force Station for refurbishment by two specially rigged recovery ships, Liberty Star and Freedom Star.

Three successive launch scrubs for weather reasons prevented the planned testing of the submarine in actual mission conditions. Because of the high cost of renting the submarine, it was returned to its owner before the rescheduled launch date.

If used in future Shuttle missions, the one-man submarine, designated DeepWorker 2000, would be used to evaluate its ability to duplicate the job USA divers presently do at the recovery site. Using a manipulator arm, the submarine pilot would demonstrated capabilities to cut tangled parachute riser lines, if necessary, and attach a Diver Operator Plug (DOP) used to extract water and provide flotation for the SRB. A team of USA divers currently performs these operations at depths of as much as 120 feet, sometimes under hazardous conditions.

The Deep Worker 2000 one-man submarine, with with its manipulator arm at front, sits on the Liberty Star recovery ship at Cape Canaveral Air Force Station.

The newly designed DeepWorker 2000, built by Nuytco Research Ltd., North Vancouver, British Columbia, is 8.25 feet long, 5.75 feet high and weighs 3,800 pounds. It can explore to depths of 2,000 feet and is equipped with a package of eight high-powered thrusters, double the number used during preliminary testing at Port Canaveral last August.

Future tests also may include evaluation of a new Enhanced Diver Operator Plug (EDOP) that features a motor powered locking mechanism that replaces the present manual system to enhance diver safety and reduce work load at depth. It also has been streamlined for easier handling underwater.

Weather ...

(Continued from Page 1)

problem during ascent.

The weather at KSC was fine on the third attempt, but the planned launch succumbed to poor conditions at all three of the Trans-Atlantic Landing Sites — two in Spain and one in Morocco.

Launch Director Dave King praised the efforts of KSC's workers in being prepared for a launch on three straight days.

"We made three great attempts," King said. "We had everything in position, had a great vehicle, had very good ground support equipment and a super team that pulled all this together to be able to get ready to go three days in a row. (Preparing to launch) three days in a row is a difficult thing to do, but this team did an excellent job of that."

Atlantis will remain on Launch Pad 39A until the next launch attempt, currently targeted for about 6:33 a.m. on May 18. The countdown clock is scheduled to begin at the T-43 hour mark on the morning of May 15.

The consecutive launch attempts put considerable strain on KSC's supply of liquid oxygen and liquid hydrogen, the propellants used in the Shuttle's external tank. With three consecutive days of fueling operations, KSC drained the storage tanks at Pad 39A. The liquid oxygen tank holds almost 900,000 gallons and the liquid hydrogen tank more than 825,000 gallons.


Air Force Captain Cliff Stargardt of the 45th Weather Squadron shows landing site wind readings to reporters at the KSC Press Site on the day of a launch attempt.

Tankers began arriving to restock the tanks between the third weather scrub and the rescheduled launch attempt. Shuttle Test Director Steve Altimus said KSC will receive about 75 tankers carrying more than 300,000 gallons of liquid oxygen by next week.

Another 25 tankers will bring 250,000 gallons of liquid hydrogen.

The liquid oxygen comes from a supplier in Brevard County and the liquid hydrogen from a supplier in Louisiana.

N. Mexico students savor trip

On one level, Dylan Chavez had a typical teenager's reaction after gazing at the Space Shuttle Atlantis perched on Launch Pad 39A: "The most awesome thing I've ever seen in my life."

Unlike the average teenager, however, Chavez doesn't regard the sight as something disconnected from his own life. The senior at Valley High School in Albuquerque, N.M., unequivocably expects to be inside an orbiter some day.

"I want to be an astronaut," Chavez said confidently. "I will be an astronaut, or I'll build a shuttle — one of the X-shuttles. ...It's something I've wanted a long, long time. It won't change on me. I have set my course, and I'm going to be here, for sure. This really solidifies everything for me."

Chavez was one of 90 representatives of the New Mexico Mathematics, Engineering and Science Achievement (MESA) Program who recently spent two days at KSC, touring facilities and meeting with mentors. MESA students, high school seniors who hold grade-point averages of at least 3.2 and tutor other students in math and science, have made the spring trip for the past 12 years.

The MESA program has close ties to the NASA Training Project at the University of New Mexico. Evangeline Sandoval Trujillo, MESA's executive director, said that 40 percent of the university program's students have MESA backgrounds.

The program involves 4,000 students in 89 schools. Program officials evaluated the students based on grades and, more importantly, leadership and community service before selecting the 90 who made the trip to Florida.

Chavez may be one of the most exceptional students in the group. He has been accepted to Massachusetts Institute of Technology, where he plans to study aerospace engineering. He belongs to 13 clubs and organizations at his school, lettered in two sports and volunteers for a homeless shelter and Habitat For Humanity. He spends what little free time he has exploring NASA web sites.

"These kids are from all sectors of New Mexico, and they're considering a career with NASA," Sandoval Trujillo said. "That to me is an inspiration."

In addition to the two launch pads, the students toured the Vehicle Assembly Building, Orbiter Processing Facility and Launch Control Complex during their first day at KSC. They also visited the Saturn V Facility and took a drive through Merritt Island National Wildlife Refuge.

For the second day, the students shadowed participating NASA employees to get an appreciation for the work of engineers and scientists. Chavez was in a group that sat in on a shuttle systems meeting.

His only disappointment came from the group's departure date — just four days before the planned launch of Atlantis on STS-101.

"It drives me crazy to be that close," Chavez said. "But it's nice to see how everything flows before the launch, too, which is just as important."

Like many of the MESA students, Victoria Serafin had never been outside the Southwest before the trip.

"If somebody asks me, 'How was Florida?' I'll probably say: 'It was green,'" Serafin said. "New Mexico is so dry."

But the foliage wasn't all that made an impression on Serafin, a senior at Cobre High School in Bayard, N.M.

"I didn't know what to expect, and it's amazing when they tell you how they put everything together," she said. "I never thought so much detail went into it. ... Everyone is just like me — they didn't expect it to be this intriguing, and everyone's enjoyed it."

Learning environment

Astronaut Rick Searfoss stands with participants in Eco-Trek 2000, an environmental summit for students held on April 19 at the Visitor Complex. KSC hosted the middle-school students, who presented the results of their team projects on how the space program helps protect our natural resources. The event included students from Central, Cocoa Beach, DeLaura, Edgewood, Explorer, Hoover, Jackson, Jefferson, Johnson, Madison, McNair, Southwest and Stone middle schools from Brevard County.

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KSC Visitor Complex Job Fair

Kennedy Space Center Visitor Complex is having a job fair on Saturday, May 6, from 9 a.m. to noon.

The job fair will be held in the new Early Space Exploration Building next to the Visitor Complex main entrance. On-site interviews will be conducted by hiring managers, and all applicants are eligible for door prizes and giveaways.

Asian-Pacific Heritage Month luncheon

In recognition of Asian-Pacific Heritage Month, the Asian Pacific and American Working Group (APIAWG) will hold its Annual Luncheon on Wednesday, May 17, at 11 a.m. in the Mission Briefing Room of the O&C Building. Tickets are available at $8 per person through May 12.

Please call Kenny Aguilar (867-2307), Marina Harris (867-3801), Rupert Lee (867-1403) or Paula Nosca (867-0745).

Anyone interested in volunteering is urged to contact one of the people listed above.

KSC looks ahead to storm season

Do you know what Agnes, Andrew, Betsy, Cleo, David, Donna, Dora, Elena, Eloise and Inez have in common?

In the past 45 years, 37 hurricanes caused such severe death and destruction that their names have been retired. The 10 retired hurricane names listed above made landfall in Florida.

This reminder comes as KSC prepares for the official beginning of hurricane season on June 1. The Center prepared for the possible impact of three hurricanes last year — Dennis, Floyd and Irene. Floyd passed through the area in September and caused significant damage at KSC and Cape Canaveral Air Force Station.

KSC's Hurricane Awareness Training is scheduled for May 24 in the Training Auditorium at 1 p.m. Additionally, with the KSC 2000 re-organization, management wants to align our hurricane coordinators with the new directorates.

KSC employees need no reminder of the scare that Floyd provided. During its approach to Florida, the hurricane was predicted to pass just a few miles east of Cape Canaveral. Instead, favorable steering conditions caused the eye to pass about 100 miles off the coast, and major damage to the Space Center was averted.

- **WHAT**: KSC's Hurricane Awareness Training
- **WHERE**: NASA Training Auditorium
- **WHEN**: May 24 at 1 p.m.

People in other areas were not so fortunate. Floyd inflicted severe damage on the Bahamas Island, where the resulting restorations still are not complete.

The Federal Emergency Management Agency reported these effects from the hurricane in the United States:

• A total of 144,854 Floyd victims have registered for federal aid in nine declared states designated for Individual Assistance, including 74,267 in North Carolina.

• Some 220 counties were designated for federal assistance because of Floyd.

• More than 42,973 homes sustained some degree of damage from Floyd. According to surveys, some 11,779 dwellings were either destroyed or heavily damaged.

• Seventy-nine deaths and five injuries were attributed to Floyd; more than 105,580 people were sheltered.

• Insured losses for Floyd are currently estimated at $1.35 billion.

• Approximately 4 million people were evacuated in North Carolina, South Carolina, Georgia and Florida.

This badly damaged Redstone rocket shows the effect of Hurricane Floyd last September. The historic rocket was dislodged from its stand at Launch Complex 5/6 at Cape Canaveral Air Force Station. The new hurricane season begins on June 1.

Dr. William M. Gray, Professor of Atmospheric Science, Colorado State University, and a staff of Meteorologists and Statistics Professors are predicting a slightly above average hurricane season for this year. There is a 39 percent probability of one or more major hurricanes making landfall on the U.S East coast, including the Florida peninsula.

You may review Dr. Gray's "Early April Forecast of Atlantic Seasonal Hurricane Activity and U.S. Landfall Strike Probabilities for 2000" on the Internet at: **http://typhoon.atmos.colostate.edu/**

For information about KSC's program, you can contact Emergency Preparedness Officer Wayne Kee at 867-3796 or Research Planning, Inc., at 853-6861. Plans, procedures, and hurricane status can be obtained by logging on to the Emergency Operations Center Web site at: **http://207.168.201.14/apps/eoc/**

And don't forget that during the threat of a hurricane KSC operates a 24-hour status hotline at 867-7900.

Space Congress concludes

The 37th Space Congress, which opened May 2 and concludes May 5, drew participants from around the world to Cape Canaveral. Several KSC officials took part in panel discussions and other activities, among them Center Director Roy Bridges; Ed Gormel, Joint Performance Management Chief; Gale Allen, associate director Technology Programs and Commercialization; Nancy Bray of the Joint Performance Management Office; and Shannon Bartell, deputy director of Space Station and Shuttle Payloads.

Discussion topics during the event included the history of rocketry and space exploration, the development of the global commercial marketplace, strategic roadmaps to future space exploration. The meetings were scheduled to culminate with an astronaut interaction session.

The keynote speaker for the opening day was Lou Dobbs, chairman and chief executive officer of Space.com, a New York-based Internet news service.

The theme for the gathering of space industry officials, "Space Means Business in the 21st Century," drew attention to the evolution that is taking space business from pure science and engineering to commercialization and privatization.

Slumber spectacle awaits kids

The KSC Visitor Complex is offering " the best sleepover on the planet." Overnight Adventure gives students or youth groups a space experience like no other. Activities include an IMAX® 3-D film, an eye-popping tour of KSC after dark, a pizza party dinner and snoozing under the largest launch vehicle in the world, the Apollo/Saturn V moon rocket.

Kids will participate in the "Great Rocket Scavenger Hunt," and be entertained by special guests like "Mrs. Lilac Newton," long lost cousin of Sir Isaac Newton. This motivational experience will educate and inspire participants to realize their dreams.

Dinner, midnight snacks and breakfast are included in the $60 price. The rate for chaperones is $40. Each participant will receive a special patch commemorating their overnight space adventure. All groups will receive a model rocket kit and a certificate of participation. This program is designed for organized students and youth groups, ages 8-14. For more information or to book an Overnight Adventure, call Katha Endress at (321) 449-4289.

Astronaut Andy Thomas displays a likeness of the Olympic torch that will travel on mission STS-101.

Olympic torch gets flying start

When the Olympic torch completes an extended tour of Australia this summer as a prelude to the Sydney Games, a companion torch will have even more mileage to its credit.

A replica of the Olympic symbol is set to travel aboard Atlantis on STS-101, scheduled to launch from KSC on May 18. Stowed below the crew compartment, the torch will traverse approximately 4 million miles in space during the mission. The Sydney 2000 Games Olympic flag also was stowed aboard Atlantis.

The torch's ride to the International Space Station resulted from the efforts of NASA astronaut Andy Thomas, a native of Australia.

"I had the idea about a year ago to see if we could fly the Olympic torch," Thomas said. "That was approved by all the appropriate people. The official torch relay is going to start (in May), so this is a sort of unofficial preliminary to that."

Thomas appeared at KSC during launch attempts on April 24 and 25 to draw attention to the torch. He demonstrated a replica of the device, a gracefully curved instrument made of lightweight metals.

The Shuttle flight was expected to precede the official Olympic Torch Relay, which begins in Greece following the lighting of the Mother Flame in Olympia on May 10. The ambitious relay will take the torch underwater to the Barrier Reef and through the nations of Oceania on its way to Australia. Plans call for 11,000 torchbearers to carry the symbol within an hour's drive of 85 percent of the Australian population.

The Sydney Games will take place in September.

"(Australians) are very excited about it," Thomas said.

Thomas, a veteran of two space missions, packed a boomerang aboard the Space Shuttle for his first mission — a gesture intended to ensure his return.

Thomas last flew in 1998 on STS-89, a docking mission to the Mir Space Station. He returned to Earth 141 days later with the crew of STS-91.

"It's good to be back here (at KSC)," he said.

Directors ready to launch KSC 2000

All proposed directors have verified they are "go" for "Launching a Vision" into the new KSC organization on May 8. Center Director Roy Bridges met with all new directors April 28 in a readiness-review-type format to report open items, issues and their readiness to proceed.

Jim Jennings, deputy director for business operations, and Rick Arbuthnot, lead of the Cross Cutting Team, were to meet the week of May 1 with NASA Headquarters stakeholders for final approval of the new organization.

All NASA employees were notified this week of their positions within the new organization by the Workforce Planning Team (WPT). Several upcoming events have been scheduled for employees to learn about their new roles and directorates.

The first event, the KSC 2000 Open House, is being held in the Operations and Checkout Building Mission Briefing Room from 8:30 a.m. until 11:30 a.m. on Monday, May 8. This event will give civil service, contractor and Air Force employees an opportunity to meet the new directors and senior managers informally.

To further communicate the changes and vision for KSC, Bridges has begun personal visits with each directorate to share his perspective on their role in the new organization. Most of the visits will begin on May 9 and continue through the end of the week.

And finally, no Center-wide project would be complete without a wrap-up to celebrate the successful finale to the KSC 2000 reorganization and the kickoff of the new KSC team. Civil service employees are invited to the project celebration at KARS II May 12 from 3 p.m. until 4:30 p.m.

The Move Planning Team has reserved the Memorial Day weekend to move the bulk of those employees who will physically move to another location. The possible landing of the Space Shuttle Atlantis on May 29 is not expected to affect the move plans.

Details of the new organization will be highlighted in the next issue of *Spaceport News*. Visit the KSC 2000 Web site for more information about these upcoming events: **http://ksc2000.ksc.nasa.gov/default.htm**

KSC employee receives safety award

Greg S. Breznik, a KSC employee, received one of four 1999 QASAR (Quality and Safety Achievement Recognition) Awards presented on April 27.

Breznik, an employee in KSC's Electrical Systems Division, received the award for most significant safety or quality improvement, service improvement, or initiative from a NASA employee external to the safety or mission assurance organization.

NASA Administrator Daniel S. Goldin presented the awards at the 15th Annual NASA Continual Improvement and Reinvention Conference on Quality Management in Alexandria, Va.

The other winners: David B. King of Ames Research Center, Steven Cronk of Dryden Flight Research Center and Christopher S. Strong of AverStar Inc.

John F. Kennedy Space Center

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